Answer on Question #37888 – Math - Statistics and Probability

Assignment

The next 2 questions refer to the following scenario. Suppose the manager of a pet store wants to determine if there is a difference in the amount of money spent in the store, on average, by owners of dogs vs. owners of cats. Consider dog owners as group 1 and cat owners as group 2. Assume that the population standard deviations are equivalent between groups. Below are the sample data for the nine dog owners and the 9 cat owners. Test the hypothesis at alpha equals 1%.

The hypothesis at Ho: μ1 = μ2 vs. Ha: μ1 ≠ μ2.

Group1	Group 2
36	35.5
19	32.5
24.5	30
27	31.5
20	35.5
35	38
24.5	34.5
23.5	36
27.5	26

15) What is the p-value and test statistic used to test this hypothesis?

a) 0.0162 2.134
b) 0.9961 -2.134
c) 0.0339 3.044
d) 0.0756 3.044
e) 0.0077 -3.044

16) Is there a significant difference in the amount of money spent in the pet store, on average, by owners of dogs vs. c

Solution

Assumptions: 1. Both populations are normal. 2. The population standard deviations σ_1 and σ_2 are equal. From Excel data analysis (t-test: two sample assuming equal variances) we obtain p-value=0.0086 (two-tail), t-stat=-2.99, t critical two-tail=2.92. Since the p-value is 0.0086 is less than significance level 0.01, it can be concluded that there is a difference between means, so the evidence of H_a is moderately strong.

Now we apply statistical methods. The hypothesis at Ho: μ1 = μ2 vs. Ha: μ1 ≠ μ2. Let X_i be observations from Group 1, $i = 1, \dots, 9$, let Y_j be observations from Group 2. Calculate $n_1 = n_2 = 9$, sample means $\bar{X} = 26.33$; $\bar{Y} = 33.28$, sample standard deviations $s_1^2 = 5.91$, $s_2^2 = 3.68$.

$$s_{pooled}^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2} = \frac{8*5.91+8*3.68}{16} = 4.79$$

We employ test statistic

$T = \frac{\bar{X}-\bar{Y}}{s_{pooled}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}} = \frac{(26.33-33.28)}{\sqrt{4.79}*\frac{\sqrt{2}}{3}} * 4.79 = -32.41$, d.f.=$n_1 + n_2 - 2 = 16$, we approximate the tabled value as $t_{0.01} = 2.92$, so the rejection region is R: $|T| \geq t$. It is true, this value lies in the rejection region R. Consequently, at the 0.01 level of significance, we reject the null hypothesis in favour of the alternative hypothesis that there is a significant difference in the amount of money spent in the pet store, on average, by owners of dogs vs. c